Amazon - Virginia Tech Initiative for Efficient and Robust Machine Learning
Call for Doctoral Student Fellowships

The Amazon-Virginia Tech Initiative for Efficient and Robust Machine Learning invites nominations for doctoral student fellows with anticipated support beginning Fall Semester 20234. Fellowships will be awarded to Virginia Tech doctoral students that includes one academic year of funding, tuition, travel support to conferences, and an invitation to interview for an Amazon internship intended to provide students a greater understanding of industry and use-inspired research. Students selected for fellowships will be known as **Amazon Fellows**. The fellowship enables students during the academic year to pursue independent research projects in the areas of machine learning and artificial intelligence and the optional paid summer internship at Amazon will enable them to gain valuable industry insight and experience through direct engagement with Amazon researchers.

Nominations for fellowships should be made by Virginia Tech faculty members. Students cannot submit nominations on behalf of their advisor. Students must be enrolled in a PhD program at Virginia Tech, be in good standing, and should have exhibited outstanding academic performance to be eligible for a fellowship. Additionally, students must be in the second, third, or fourth year of their Ph.D. studies and pursuing doctoral-level research in machine learning, data science, AI, and/or NLP.

Context:
Amazon is improving customers' lives with practical, useful generative AI innovations. We do this by building and deploying AI across three technology layers: at the bottom layer we offer our own high performance and cost-effective custom chips, as well as a variety of other computing options including from third-parties. At the middle layer, we offer customers choice by providing the broadest selection of Foundation Models—both Amazon-built as well as those from other leading providers. At the top layer we offer generative AI applications and services to improve every customer experience.

There are three things that distinguish Amazon's approach to the development and deployment of AI:
1. Maintaining a strategic focus on improving the customer and employee experience through practical, real-world applications of AI;
2. Marshaling our world-class data, compute, and talent resources to drive AI innovation; and
3. Committing to the development of responsible, reliable, and trustworthy AI.

Topics of interest would include, but are not limited to, those below. Please feel free to bring your/your institution's unique viewpoint and expertise to these topics:

Large Language Models (LLMs):
- Retrieval augmented generation (RAG), fine-tuning and alignment (SFT, RLHF), and efficient inference: ensuring accuracy and reducing hallucinations; maintaining privacy and trust; reasoning over long contexts;
- Long form context methods
- Improving data efficiency; effectively distilling models for real-time inference, data quality checks
- Multi-lingual LLMs and challenges for cross-language defects (e.g. cross-language hallucinations)
- Synthetic data generation for LLM learning
- Adapting LLMs for dynamic content (e.g., feeds, web content) in knowledge-augmented scenarios
- Tool and Code Empowered LLM
- External Knowledge and Domain Knowledge Enhanced LLM and Knowledge Updating

Vision-Language:
- Multimodal learning and video understanding: retrieval with multimodal inputs (e.g., video, image, text, speech);
- Adversarial ML with multimodal inputs

- Comprehensive video understanding with diverse content (open-vocabulary).
- Shared multimodal representation spaces, aligned codecs
- LLM and VLM based Intelligent Agents

Search and Retrieval:
- Personalization in Search, semantic retrieval, conversational search: understanding descriptive and natural language queries for product search; retrieving information using LLMs' output
- Search page optimization (ranking) using heterogeneous content such as related keywords, shoppable images, videos, and ads
- Tool Learning for Proactive Information Seeking

Efficient Generative AI:
- Novel model architectures for improved performance (accuracy & efficiency)
- Training large neural network models with efficiency: High performance distributed training and inference algorithms for Generative AI systems, quality metrics and evaluations

Responsible Generative AI
- This may include, but is not limited to measurement and mitigation, guardrail models, privacy concerns, detecting and mitigating adversarial use cases, and machine unlearning and model disgorgement
- Responsible AI for audio, image and video generation
- Privacy preserving continual learning/self-learning
- Fact Checking and Factual Error Correction for Truthful LLMs

While the above topics are particularly of interest, highly meritorious nominations in other areas of ML and AI will also be considered.

Each selected Amazon fellow will receive
- $24K stipend (academic year)
- Tuition will be covered
- Invitation to interview for an Amazon internship
- Travel support of $1K to attend conferences in student's area of research

Fellowship Timeline
- April 26, 2024 (5pm EDT): Fellowship Nominations/Applications Due
- April 2, 2024 Information Session open to the VT community
- June 26, 2024: Fellowship Decisions Announced
- Aug 10, 2024: Fellowships begin in the Fall Semester
- July 31, 2025: Fellows must submit a brief report of their past year activities

Nomination materials
All nomination materials should be submitted in PDF format, single-spaced, 12pt font, one-inch margins by the Virginia Tech faculty member nominating the student for the fellowship. Nomination should include:
- Student's CV (2 pages maximum), with education, work experience, awards, publications, including link to his/her webpage;
- Student's personal statement (2 page maximum) including a description of their background, research so far, and further work that the fellowship will enable them to pursue
- Two letters of recommendation from Virginia Tech faculty members. One of these letters must be from the student's doctoral advisor.

Fellowship nominations and any questions about nominations should be addressed to Naren Ramkarishnan, Director of the Amazon-VT initiativve at amazon-vt@cs.vt.edu.

Review Criteria

A joint VT-Amazon advisory board will review applications based upon

- Statement
- Research experience/publication record

If you have any additional questions about the Amazon - Virginia Tech Initiative for Efficient and Robust Machine Learning or the fellowship nomination process, please refer to the following FAQ.